**South Dakota Agricultural Education (AFNR)**

**Academic Integration Activities**

**ACTIVITY #12**

*Agribusiness Sales and Marketing students will be able to identify and use real numbers when interpreting inventory and calculating product margins.*

**1. Ag Standard**

Agribusiness Sales and Marketing, ABSM 3.1: Apply reading comprehension, writing and math skills in inventory management.

* Calculate product margin (specifically net profit).
* Interpret inventory control systems.

**2. Academic Standard**

9-12.N.1.1: Students are able to identify multiple representations of a real number. (Comprehension)

* Given a real number, identify the subset(s) of real numbers to which it belongs.
* Represent rational and irrational numbers in different forms.

**3. Background Information**

Real numbers can be written in many forms like natural numbers, whole numbers, integers, and rational numbers. Irrational numbers also exist and knowing their definition may help explain real numbers.

**Natural Numbers**

Natural numbers are also known as counting numbers. Starting at 1 and continuing forever. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 …

**Whole Numbers**

Whole numbers are all the natural numbers plus zero. 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 ….

**Integers**

Integers are all the whole numbers plus the negatives. …-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5…

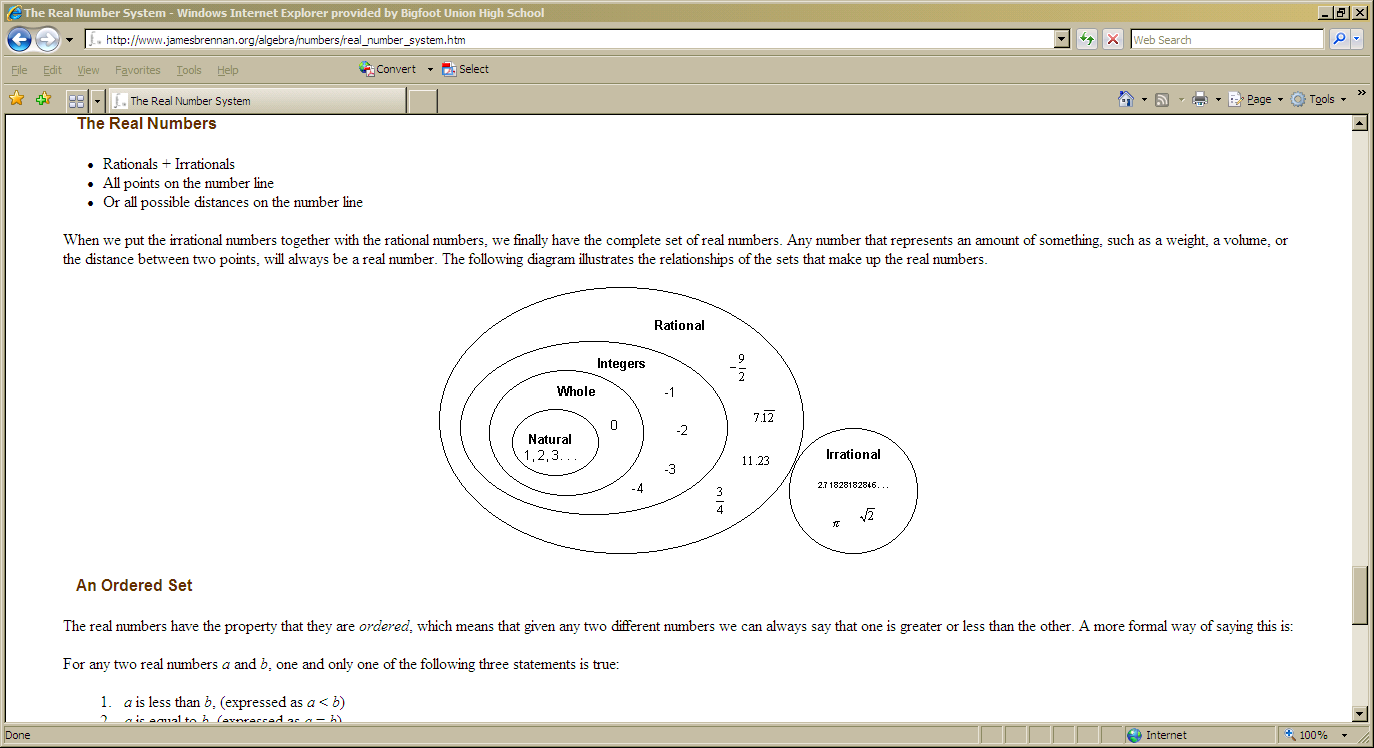
**Rational Numbers**

Rational numbers can be put into the formula a/b, where a and b are both integers and b is not zero. We often refer to rational numbers as fractions. In the fraction a/b, a is the numerator and b is the denominator. Fractions can be smaller than 1, like ½, or larger than 1, like 5/2 which can be simplified to 2 ½. All integers can be thought of as rational numbers as well, with a denominator of 1, like 3 being written as 3/1. Rational numbers as a decimal will always hit a repeating pattern, like 1.66̅ or 2.1241̅2̅4̅, or will end, like 3.75 or 6.2.

**Irrational Numbers**

Irrational numbers cannot be expressed as a ratio of integers and in decimal form will never end or find a repeating pattern. For example, or √2. These numbers as decimals never end.

Below is an image to help visualize how the real number system works.

Image from: <http://www.jamesbrennan.org/algebra/numbers/real_number_system.htm> Retrieved July 25, 2011.

**4. Example in Context**

Assume a student is working for an agricultural mail order company. That student is handed a print out from the inventory control system of current inventory on hand and a current list of orders to be shipped. They need to figure if they can fill the orders and how many items will remain after this order is filled. Based on the data given, would they be able to fill all of the orders?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Current Inventory** | **Current Orders** | **Availability After Order** | **Identify the type of Real Number** |
| Shoulder length gloves | 12652 boxes | 689 boxes |  |  |
| XL rubber boots | 389 pair | 58 pair |  |  |
| L rubber boots | 134 pair | 79 pair |  |  |
| M rubber boots | 23 pair | 65 pair |  |  |
| XL latex gloves | 987 boxes | 755 boxes |  |  |
| L latex gloves | 345 boxes | 566 boxes |  |  |

*Answer: No, the student would be able to fill all of the orders except the M rubber boots and the L latex gloves. They would be (short) -42 pairs of M rubber boots and (short) -221 boxes of L latex gloves. See chart below for complete answers.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Current Inventory** | **Orders to Fill** | **Availability After Order** | **Identify the type of Real Number** |
| Shoulder length gloves | 12652 boxes | 689 boxes | 11963 | Natural |
| XL rubber boots | 389 pair | 58 pair | 331 | Natural |
| L rubber boots | 134 pair | 134 pair | 0 | Whole |
| M rubber boots | 23 pair | 65 pair | -42 | Integer |
| XL latex gloves | 987 boxes | 755 boxes | 232 | Natural |
| L latex gloves | 345 boxes | 566 boxes | -221 | Integer |

**5. Guided Practice Exercises**

Assume a student was just hired to sell windmill turbines and was given a handbook with the capacity levels of different turbines. The chart for each turbine’s capacity is below. As part of the orientation, the sales people meet with the engineers to help understand the products. The first thing the engineer asks is which of these numbers is actually rational?

|  |  |
| --- | --- |
| **Item** | **Capacity** |
| Turbine 1 | 2√2 |
| Turbine 2 | π |
| Turbine 3 | √4 |
| Turbine 4 | 5.121221222… |

*Answer: √4 is the only rational number as it simplifies to 2.*

|  |  |  |  |
| --- | --- | --- | --- |
| ***Item*** | ***Capacity*** | ***Simplified*** | ***Type of Number*** |
| *Turbine 1* | *2√2* | *2.828427125…* | *Irrational* |
| *Turbine 2* | *π* | *3.14159265…* | *Irrational* |
| *Turbine 3* | *√4* | *2* | *Rational* |
| *Turbine 4* | *5.121221222…* | *5.121221222…* | *Irrational* |

Assume a student works at a local tractor dealership. At the end of the year they were asked to figure the net profit margin (Net income after taxes ÷ Revenue = Net Profit Margin) on a specific model of tractor. The net income after taxes on that specific model of tractors sold was $130,000, the revenue was $747,000. What is the net profit margin? Is this a real number?

Take the net income after taxes and divide it by the revenue.

$130,000/$747,000 = .174029451…

It does not end or repeat, so it is not a real number, it is irrational.

*Answer: .174029451… not a real number (note, net profit margin is often expressed in a %, in this case the net profit margin would likely be expressed at %17.4)*

**6. Independent Practice Exercises**

Assume a student began a business selling toy tractors online. At the end of the year he wanted to figure out his net profit margin. His net income after taxes was $1,500 and he had revenue of $6,000. What was his profit margin? Is this a real number?

*Answer: 0.25 or %25, this is a real number, more specifically a rational real number.*

Assume a student works at a local hardware store that sells both in store and online. They were given an inventory print out of some of the nuts and bolts and then given a print out of online orders that needed to be filled. Will the student be able to fill all of the orders with the current inventory? If not, which ones can be filled and which ones cannot? What type of numbers is the student working with?

|  |  |  |
| --- | --- | --- |
| **Item** | **Current Inventory** | **Orders to Fill** |
| ½ inch nuts | 789 | 1,233 |
| ½ inch x 3 inch bolts | 917 | 917 |
| ¼ inch nuts | 780 | 600 |
| ¼ inch x 3 inch bolts | 89 | 120 |
| ½ inch lock washers | 121 | 100 |
| ½ inch flat washers | 1,225 | 1,000 |
| ¼ inch lock washers | 2,255 | 900 |
| ¼ inch flat washers | 956 | 950 |

*Answer: The student will not be able to fill all of the orders. The ½ inch nuts and the ¼ inch x 3 inch bolts will be short. See chart for complete set of answers*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Item*** | ***Current Inventory*** | ***Orders to Fill*** | ***Availability After Order*** | ***Identify the type of real number*** |
| *½ inch nuts* | *789* | *1233* | *-444* | *Integer* |
| *½ inch x 3 inch bolts* | *917* | *917* | *0* | *Whole* |
| *¼ inch nuts* | *780* | *600* | *180* | *Natural* |
| *¼ inch x 3 inch bolts* | *89* | *120* | *- 31* | *Integer* |
| *½ inch lock washers* | *121* | *100* | *21* | *Natural* |
| *½ inch flat washers* | *1,225* | *1000* | *225* | *Natural* |
| *¼ inch lock washers* | *2,255* | *900* | *1,355* | *Natural* |
| *¼ inch flat washers* | *956* | *950* | *6* | *Natural* |

**7. Notes**

None